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ABSTRACT

The use of the Logo programing language in natural language manipulation provides the basis for the development of the computer-assisted grammar instruction program for children that is described in this paper. The computer activities suggested are designed to get children in grades 4-12 to formulate rules of grammar based on their own knowledge of English. These activities include a variation of the party game MadLibs, in Logo, which is used to present a story shell with blanks to be filled in by users, and the use of Logo to write a program that can generate random sentences. Discussions about the nature of natural language and lexical categories in particular can be generated by these programming activities. Samples of the screen displays of the various software programs discussed are included. (9 references) (EW)

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LOGO AND LEXICAL CATEGORIES

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"Convivial tools -- the telephone for example -- expand one's options, can be used without extensive training, do not restrict what messages one can convey, and do not impose time constraints on their use. Convivial curriculum materials can have similar characteristics. They can provide a structure within which a teacher can operate, but they still can provide options; indeed, they can stimulate ingenuity...In short, one function of well-designed curriculum materials is to free the teacher to teach, with ingenuity, flexibility, and confidence."

Elliot Eisner
The Educational Imagination p368

As microcomputers have filtered into classrooms, teachers have sought ways to use them to enhance learning. After an initial focus of studying *about* computers, educators now emphasize the use of computers as tools that enable us to do tasks better (word processing) or as windows for the mind that help us to know more about our own knowing (Logo). Logo is a computer language that embodies a constructionist, Piagetian, educational philosophy and it can be a powerful instrument to help students gain an explicit awareness of their intrinsic knowledge about English grammar.

Teaching grammar doesn't seem to be very popular among the people with whom I work. My classroom colleagues often feel doubtful about its practical value for students and my university colleagues argue that it is pointless to teach it since research indicates that teaching grammar does not improve writing. To the former I try to point out that knowing about grammar is a metacognitive skill that allows children to appreciate the incredibly complicated nature of the language they have mastered. To the latter, I ask why the improvement of writing must be the only justification for studying grammar. To all I suggest that using computers for exploring natural language adds not only a dimension of fun but also provides intrinsically motivating opportunities and reasons for learning about grammar.

Most computer programs that claim to teach grammar are of a traditional

prescriptive nature and are often of a drill and practice format. This approach to grammar says essentially "These are the rules. You must learn them." But one may also approach grammar from a *descriptive* perspective in which the objective is to motivate an appreciation of the rules of grammar through an understanding of them. It is this use for the computer that I find compelling. In this article, I will describe Logo activities that are intended to provide children with a reason for learning parts of speech. For without the vocabulary to describe lexical categories, it is difficult to discuss other aspects of syntax.

There are two assumptions that I bring to grammar teaching. The first is that language is best taught within a whole language framework rather than as sets of discrete skills. This is a pedagogical philosophy not held by all. The relative ease of testing isolated skills no doubt encourages a skills approach. The activities that I will describe are not meant to stand alone. The second assumption is that children have an implicit knowledge of the structures of their language and that the teacher's job is to make that knowledge explicit. Studies of child language acquisition during the past two decades have indeed given us insight into the depth of grammatical rules in even very young children. The computer activities that I suggest attempt to get children from 4th through 12th grades to formulate rules of grammar based on their own knowledge of English.

Logo has become a very popular computer language for use in schools during the past few years. Although it was developed in the late 1970's by Seymour Papert, a mathematician who studied with Piaget in Geneva, it was not until the arrival of microcomputers with sufficient memory that it became available to large numbers of people. Since its arrival on the educational scene, it has generated a

great deal of research about its potential cognitive effects on children. Most of that research has concentrated on the well-known turtle graphic capabilities of Logo. It is very easy to begin to use Logo. With a few simple commands, one can begin to make very complicated geometrical designs. Only recently have teachers begun to consider some of the language potential of using Logo with young children. Although Logo is a language with a low entry threshold, it extends in power to provide an enriching working environment even for college students. Logo is based on the artificial intelligence language LISP and is an excellent computer language for natural language manipulation.

There are probably two reasons why many classes never get to explore the language parts of Logo. The first is that Logo has often been introduced into schools as an object of study without reference to the rest of the curriculum. As an object of study its interest is limited. As an instrument with which to study, however, its use is without limit. The second reason may be that working with the language manipulation parts of Logo requires knowing more about Logo than does beginning drawing. It is, perhaps, not so immediately rewarding.

MadLibs:

The interactive nature of computers makes them an ideal medium for a variation on the old stand-by MadLibs. MadLibs are often used as party games and present a story shell with many blanks to be filled in by users. The blanks are labeled by the parts of speech needed to make a syntactically correct sentence, and part of the fun is the semantic nonsense that occurs. Many teachers use MadLibs in classrooms to give extra practice with parts of speech. Why use a computer? Because rather that do other people's MadLibs, the students can create their own.

Not only does this involve the students in writing, it creates the need for them to define the category of the words that are to be requested of the user. Actual use of their MadLibs will help children refine the explicitness of their terms.

The conceptual framework for MadLibs has two parts, a story frame with blanks, and a series of prompts that ask the user for words to put in the blanks. The following is a a very simple MadLib form that can be expanded.

The sample programs that follow are written in MIT Logo for Apple computers. Commands and syntax may differ slightly in other versions such as LCSI Logo. For example "REQUEST" in MIT Logo is expressed as "READLIST" in LCSI Logo. To create a Logo program, the teacher must first boot the computer with the Logo language. Then the program is typed in. (In the LogoWriter version, one first "flips" to the edit screen.) Once the program has been created, it can be used over and over. The students type "SIMPLE.MADLIB" and the computer asks "Type a number." Once the student has typed it, the computer asks, "Type an adjective that refers to size," etc. By answering the computer's prompts, students could create an infinite number of sentences.

```
TO SIMPLE.MADLIB
  ASK.WORDS
  STORY
END

TO ASK.WORDS
  PRINT [TYPE A NUMBER]
  MAKE "NUMBER REQUEST
  PRINT [TYPE AN ADJECTIVE THAT REFERS TO SIZE]
  MAKE "ADJECTIVE] REQUEST
  PRINT [TYPE AN ANIMATE NOUN]
  MAKE "NOUN REQUEST
END

TO STORY
  PRINT (SENTENCE [ONCE UPON A TIME THERE WERE]
  :NUMBER :ADJECTIVE :NOUN [WHO SET OUT TO SEEK THEIR FORTUNES])
END
```

Ex: Once upon a time there were 43 giant ants who set out to seek their fortunes.
Ex: Once upon a time there were 2 purple panthers who set out to seek their fortunes

There are a number of excellent sources for help in getting started with Logo MadLibs. The books by Alison Birch and Molly Watt listed in the bibliography are

especially helpful. Both books contain a variety of language activities. The Birch book comes with a utility disk with many programs ready to use while the Watt books has complete programs and lesson plans.

Generating Random Sentences:

Providing children with an opportunity to learn to program in a language such as Logo, gives them an opportunity to use the interactive capabilities of computers. This opportunity has the potential for insights into language well beyond what may take place using word processing. For example, in writing a program that requires a user to respond, the student must envision exactly what the user will see. Programming is very much involved with planning, revision and audience, as is writing.

One activity that can generate months of discussion about the nature of natural language and lexical categories in particular is trying to write a program that can generate random sentences. There are many levels on which this activity may be started, but conceptually there are a few requirements that will probably be elicited from a class discussion. We might start with the idea of 1) a list of words, 2) some rule that will draw items from that list at random and 3) a rule that writes the words as a sentence.

1) TO FUNNYWORD
   OUTPUT PICK :WORDLIST
   END

(This command tells the computer to pick a word from a list.)

2) TO PICK :OBJECT
   OUTPUT ITEM (1 + RANDOM COUNT :OBJECT) :OBJECT
   END

(This command tells the computer how to pick the word randomly.)

3) TO FUNNY.SENTENCE
(PRINT SENTENCE FUNNYWORD FUNNYWORD FUNNYWORD)
END

(This command tells the computer to write the words as a sentence.)

MAKE "WORDLIST [AND IN HERE WRITE THE LIST OF WORDS]

It is fun to let everyone in the class put one word in the list. For example imagine that the students entered the following list:

MAKE "WORDLIST [FRED SMART THE HAPPY WINS IS MARY ELEPHANT EAT IS DANCED SEVEN GREEN]

The first step might be to see how many sentences the students themselves could make from the list.

FRED IS SMART. THE ELEPHANT DANCED. MARY IS HAPPY.

Then it would be time to test the program: REPEAT 10[FUNNY.SENTENCE]

ELEPHANT ELEPHANT SEVEN
HAPPY FRED ELEPHANT
SMART HAPPY SEVEN
SMART HAPPY HAPPY
MARY IS HAPPY
SMART MARY SEVEN
GREEN SMART THE
SMART FRED FRED
FRED HAPPY WIN
IS IS SMART

Clearly something is wrong with the program. A guided discussion of the computer generated sentences will lead to the observation that people know more about language than the computer and that perhaps it would be better to have more than one list of words in order to get acceptable sentences. And a discussion of the nature of the lists will provide motivation for talking about *nouns, verbs, adjectives, etc.* There are many directions in which this lesson could lead depending on what aspects of grammar one wishes to focus. I will briefly describe two lessons that have been successful for me. The first is a focus on word

order and semantics; the second on subject verb agreement. With the class we adapted our original programs.

Word order:

```
TO FUNNY.SENTENCE
 (PRINT SENTENCE ADJECTIVE NOUN VERB)
END

TO NOUN
 OUTPUT PICK :NOUNLIST
END

TO VERB
 OUTPUT PICK :VERBLIST
END

TO ADJECTIVE
 OUTPUT PICK :ADJECTIVELIST
END

TO PICK :OBJECT
 OUTPUT ITEM (1 + RANDOM COUNT :OBJECT) :OBJECT
END
```

Try with the following lists:

```
MAKE "NOUNLIST [DOG TREE JOHN FOOD BANANAS]
MAKE "VERBLIST [RUNS ATE SANG KISSED TOLD]
MAKE "ADJECTIVELIST [PRETTY RED HAPPY SAD SMART]
```

This variation generated the following:

1 SAD JOHN SANG
2 SAD JOHN ATE
3 RED TREE SANG
4 HAPPY JOHN RUNS
5 SMART FOOD SANG

Are any or all these sentences acceptable? Perhaps students will comment that the third and the fifth don't make sense. This could lead to a discussion of semantic categories and animate or inanimate nouns as subjects for active verbs.

Try changing the order of the words in the FUNNY.SENTENCE program.

```
TO FUNNY.SENTENCE
 (PRINT SENTENCE ADJECTIVE VERB NOUN)
END
```

With the same lists, the following might occur:

1 PRETTY ATE BANANAS
2 SAD ATE JOHN
3 HAPPY KISSED TREE
4 PRETTY SANG BANANAS
5 SMART RUNS DOG

It is unlikely that students will find these acceptable. Discussion should lead to observations about word order and further examples could be tested. Another variation on the FUNNY.SENTENCE program could focus on subject verb agreement.

```
TO FUNNY.SENTENCE
 (PRINT SENTENCE NOUN VERB)
END

TO NOUN
  OUTPUT PICK :NOUNLIST
END

TO VERB
  OUTPUT PICK :VERBLIST
END

TO PICK :OBJECT
 OUTPUT ITEM (1 + RANDOM COUNT :OBJECT) :OBJECT
END

MAKE "NOUNLIST [DOGS CRACKER BIRDS TURTLE GIRL]
MAKE "VERBLIST [ SING DANCES WALK TALKS PLAY]
```

This generates the following examples:

DOG TALKS
GIRL DANCES
CRACKER PLAY
BIRDS SING
CRACKER SING
TURTLE DANCES
GIRL SING

If the students classify these the following might result:

good	????	**bad**
GIRL DANCES	TURTLE DANCES	DOGS TALKS
BIRDS SING	CRACKER TALKS	CRACKER PLAY
		CRACKER SING

A discussion ought to lead to the rule of subject verb agreement. It should also lead to the observation that sentences can be well-formed in terms of grammar, but not good in terms of meaning since most crackers don't talk. This strand could be carried further by exploring lists of verbs of different types and different tenses.

Conclusion: The random sentence challenge is almost without limit in its potential variations. It provides a terrific environment in which to explore language. With it, students are facing the same problems as computer scientists and linguists in the attempt to teach computers to use natural language. Logo gives even young children tools with which to explore the problem. Just as computer scientists and linguists have learned a great deal about natural language in the attempt to get computers to use English, so can younger students reflect on the nature of their own language as they try to get a computer to generate well formed English sentences.

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In addition, *The Logo Exchange* and *The Computing Teacher* both published by ICCE, Eugene, Oregon, have regular columns on language uses of Logo.